

## Rising carbon prices increase viability of low-carbon technologies

Carbon reduction strategies will be a key focus for many businesses this year. But challenges await, as both mandatory and voluntary carbon markets are far from perfect. In Europe, current carbon price levels support the business case for green technologies like Carbon Capture and Storage (CCS), unsubsidised solar PV systems and wind energy



### Carbon pricing: a priceless solution to the tragedy of the commons

A healthy and sustainable climate is a common good that requires everyone to do their part. Yet so often, companies pursue their own short-term gains at an ultimate cost to the many, a problem in economics known as the '[tragedy of the commons](#)'.

This is a particularly pressing concern for carbon emissions. In most cases, the emitting company does not pay in full for the damage it causes, like air pollution, or the physical impact of climate change. In economic terms, the cost of carbon emissions to society is higher than the private cost to the polluter, which all but guarantees higher emission levels than the [climate can sustain](#).

The solution is simple, in theory. By putting a price on carbon equal to its social cost, emissions are likely to be reduced to levels that the earth can sustain. That's a solution [corporate leaders](#) and policymakers are increasingly relying on in their race to a net-zero economy, as it provides them with a tool to reduce emissions in a cost-effective way, as seen in [Europe](#) and [China](#).

This article provides a quick guide to carbon pricing for corporate decision-makers who will have to address this issue head-on in the coming years.

## **Mandatory carbon markets are increasingly a topic for corporate decision-makers in manufacturing and the energy sector...**

Governments around the world are starting to price carbon by imposing mandatory carbon markets on energy-intensive sectors, notably the power sector and manufacturing such as steel, cement, plastic and petrochemical industries. According to the [World Bank](#), the number of carbon pricing schemes around the globe increased from 19 in 2010 to 64 today.

In theory, these carbon pricing schemes are effective for two reasons. First, they are mandatory, with governments forcing the targeted industries and companies to comply. Second, the emissions reduction target is met by design. The yearly emissions cap is decreased over time in line with the targeted level for emissions in the future.

Carbon pricing schemes are also efficient, as the market decides the mechanism for reducing emissions. Companies will first apply the most cost-efficient measures, such as cheap energy efficiency technologies (think of insulation, led lighting or recycling) and behavioural change.

More costly technologies are employed when the reduction targets cannot be met with the cheapest options. As the overall emissions cap is reduced over time to limit carbon emissions, the carbon price rises. And with higher carbon prices, the business case for low carbon technologies becomes more viable.

## Europe's carbon price tripled in 2021 to €90

European carbon price in mandatory EU ETS market in euro per ton carbon



Source: ING Research based on Refinitiv

In Europe for example, the business case to [capture and store carbon \(CCS\)](#) is becoming feasible at current carbon prices, above €80 per ton of CO<sub>2</sub>, particularly in carbon-intensive manufacturing clusters where governments and grid operators build the infrastructure to transport carbon.

## Carbon pricing favours emission reduction strategies with low abatement costs

Indicative carbon abatement costs in euro per ton CO<sub>2</sub> in Europe\*

Power sector**	Manufacturing	Built environment	Road transport	Agriculture and land use
<b>Very low cost emission reduction technologies (below 50 euro/ton)</b>				
<ul style="list-style-type: none"> <li>Large scale solar plants in open fields</li> <li>CCS on coal power plants</li> </ul>	<ul style="list-style-type: none"> <li>Recycling</li> <li>Energy efficiency improvements</li> </ul>	<ul style="list-style-type: none"> <li>Behavioral change</li> <li>Foil for radiators</li> <li>Weatherstrips to prevent draft</li> <li>Energy efficient appliances</li> <li>LED lighting</li> <li>Large scale rooftop solar energy on commercial buildings</li> </ul>	<ul style="list-style-type: none"> <li>Behavioral change (lower speed)</li> <li>Improved aerodynamics</li> <li>Right tyre pressure</li> <li>Increase emission standards for truck manufacturers</li> </ul>	<ul style="list-style-type: none"> <li>Prevention of deforestation</li> <li>Increase ground water level in meadows to lower peat emissions</li> <li>Led lighting in greenhouses</li> <li>Replace gas- by geothermal heating in greenhouses</li> </ul>
<b>Low cost emission reduction technologies (50-100 euro/ton)</b>				
<ul style="list-style-type: none"> <li>Substitute coal for gas</li> <li>CCS on gas fired power plants</li> <li>Mandatory closures of coal fired power plants</li> <li>Onshore wind energy</li> </ul>	<ul style="list-style-type: none"> <li>Substitute coal for gas</li> <li>CCS steel and cement factories</li> <li>CCS production hydrogen and ammonia</li> <li>CCS refineries</li> </ul>	<ul style="list-style-type: none"> <li>Optimisation of existing heating and cooling systems (optimal adjustment)</li> <li>Heat recovery in commercial buildings</li> </ul>	<ul style="list-style-type: none"> <li>Increase emission standards for car manufacturers</li> </ul>	<ul style="list-style-type: none"> <li>Increase carbon absorption of land e.g. with olivine sand</li> <li>Advanced land fertilisation (injection instead of manure spreading)</li> <li>Reforestation</li> </ul>
<b>High cost emission reduction technologies (100-150 euro/ton)</b>				
<ul style="list-style-type: none"> <li>Biomass power plant</li> <li>Offshore wind energy</li> </ul>	<ul style="list-style-type: none"> <li>CCS waste incineration plants</li> <li>CCS biomass (negative emissions)</li> <li>Biomass</li> <li>Wind energy</li> <li>Solar energy</li> </ul>	<ul style="list-style-type: none"> <li>Rooftop solar panels on houses</li> </ul>	<ul style="list-style-type: none"> <li>Electric vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Biomass heating</li> <li>Change diet of animals so they emit less methane</li> </ul>
<b>Very high cost emission reduction technologies (&gt;150 euro/ton)</b>				
<ul style="list-style-type: none"> <li>Bio gas</li> <li>Synthetic fuels like hydrogen</li> </ul>	<ul style="list-style-type: none"> <li>Bio gas</li> <li>Synthetic fuels like hydrogen</li> <li>CCS: direct air capture</li> </ul>	<ul style="list-style-type: none"> <li>Renovation / insulation</li> <li>Rooftop solar</li> <li>Heat pumps</li> <li>Geothermal heat</li> <li>District heating</li> <li>Wind energy</li> <li>Green gas</li> </ul>	<ul style="list-style-type: none"> <li>Blending biofuels</li> </ul>	<ul style="list-style-type: none"> <li>Bio gas from manure fermentation</li> </ul>

\*Abatement costs are indicative as they are highly dependent on the specifics of a project. Table indicates whether strategies are cheaper or more expensive compared to each other. \*\*In 'normal' energy markets with gas, coal and power prices around long term average.

Source: ING Research based on PBL, Aurora, CE Delft and SEO

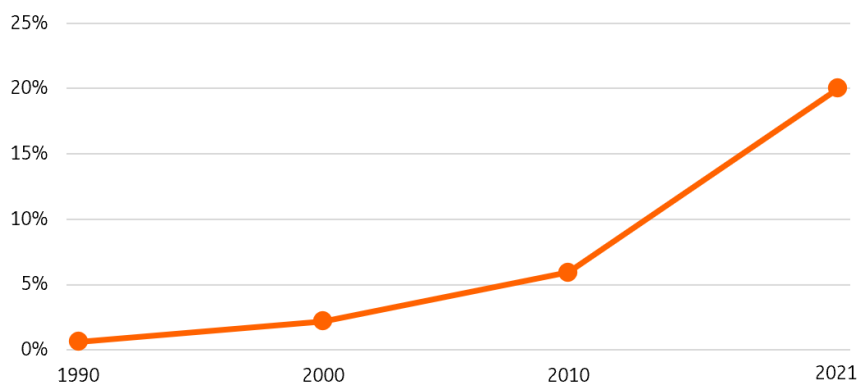
The [European Commission](#) is exploring ways to extend mandatory carbon pricing to other sectors such as shipping, road transportation and buildings. If it follows up with action, carbon pricing will also become relevant for corporate decision-makers in sectors like shipping, road transportation and real estate. Note however that the abatement costs (the cost of removing undesirable byproducts created during production) for many technologies in these sectors are generally much higher compared to manufacturing and the power sector.

## ...and carbon markets need to be strengthened to reach the Paris Climate Goals

21.5% of global greenhouse gas emissions were covered by carbon pricing instruments in 2021, according to the World Bank's [carbon pricing monitor](#). That represents a significant increase from 2020, when only 15.1% of global emissions were covered.

## One fifth of global greenhouse gas emissions are currently covered by mandatory carbon pricing

Share of global emissions covered by mandatory carbon taxes and emissions trading schemes



Source: ING Research based on World Bank and DNB

However, just under 4% of these emissions are priced within the €35-70 range per ton of CO<sub>2</sub> that is currently needed to meet the 2°C temperature goal of the Paris Agreement. No emissions in carbon pricing schemes are priced around €130-140 per ton of CO<sub>2</sub> that the World Bank considers to be in line with the 1.5°C target.

So, the vast majority of global greenhouse gas emissions (almost 80%) is not priced at all. And the carbon price is usually too low to bring emissions in line with the climate goals. Corporate decision-makers should anticipate an increase in carbon pricing if policymakers stick to the Paris Climate Goals.

## Carbon border taxes could become an issue in competition with foreign companies

Mandatory carbon markets are local by definition as governments cannot act outside their jurisdictions. There is no global carbon market as a result.

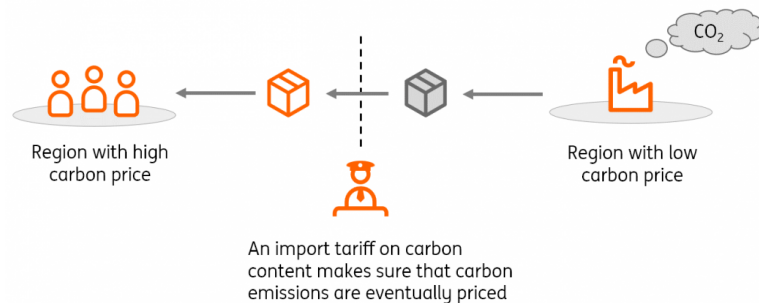
Jurisdictions across the globe have their own carbon pricing mechanisms that result in different carbon price levels. For example, carbon prices currently stand at around €90/ton in the EU, about €72/ton in the UK, about €28/ton in California and around €6/ton in China.

Different price levels create incentives for corporate decision-makers to relocate carbon-intensive activities towards regions with no or low carbon prices. It also works the other way round, providing incentives to keep existing activities in those regions. In both cases, carbon-intensive products are then imported back into the jurisdictions with higher carbon prices, a process called carbon leakage.

Hence the need for Carbon Border Adjustment Mechanisms (CBAM, a proposition by the [EU Commission](#)) to ensure a level playing field between major production and trade regions such as the European Union, the US and Asia (notably China and India). Of course, there wouldn't be a need for border adjustments if all major production regions in the world priced emissions locally

and more or less at the same price.

## A carbon border adjustment mechanism prices carbon emissions equally across the globe



Source: ING Research

The [CBAM](#) is a tariff on imports in line with the embedded carbon content of the product, which has not been taxed in the country where the good is produced. It ensures that the carbon emissions are eventually priced.

It also provides governments in producing countries with an incentive to increase carbon prices, as the CBAM would allow them to reap the tax benefits of the carbon policies themselves rather than allowing other countries to benefit from import taxes. That could bring about much-needed global coordination between countries to align climate policies and carbon prices. In the meantime, corporate decision-makers might include CBAM in their competition and pricing strategies.

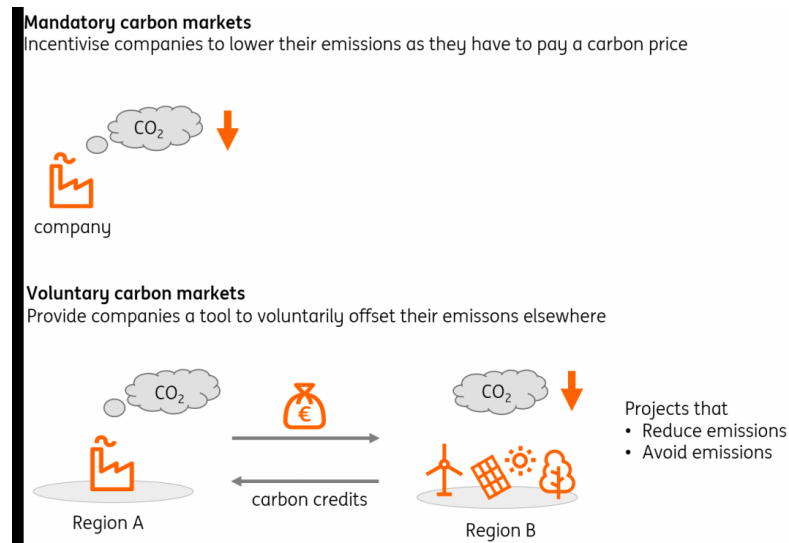
## Voluntary carbon offsetting schemes could be on the agenda...

Currently, most mandatory carbon pricing schemes apply to the power sector and manufacturing. Still, with increasing pledges to net-zero strategies, a growing number of companies are looking for ways to reduce or offset their emissions, whether or not they are already subject to mandatory schemes. They can do so in [voluntary carbon markets](#).

Voluntary carbon markets (in short VCMs) are initiatives that facilitate trade in emission units, called carbon credits, generated from emission reduction activities. Companies can participate in a VCM either individually or as part of an industry-wide scheme, such as the [CORSIA](#).

## Two ways to incentivise companies to lower carbon emissions

### Mandatory versus voluntary carbon markets



Source: ING Research

VCMs are often initiated by non-governmental bodies, as opposed to mandatory carbon markets that are set up by governments. VCMs often involve multiple countries. Usually one country has much lower abatement costs than the other country. Hence, VCMs provide a way to offset emissions in regions with the lowest abatement costs and direct green investment from richer to poorer regions.

## Main differences between mandatory and voluntary carbon markets

Differences on goals, instruments and economics

	Mandatory carbon markets	Voluntary carbon markets
<b>Aim</b>	Reducing carbon emissions. Each participant is attributed allowances which they can then trade to meet their carbon budget	Offsetting carbon emissions by preventing or reducing emissions elsewhere
<b>Regulator</b>	Government	No regulator. Independent standard-setters certify projects
<b>Region</b>	Within the jurisdiction	Often outside the jurisdiction
<b>Scope</b>	Mostly energy-intensive sectors (power sector and manufacturing)	Broad range of projects in all kinds of sectors
<b>Instrument</b>	Carbon allowances	Carbon credits
<b>Climate impact</b>	Uniform: every allowance taken out of the market saves a ton of carbon	Different: credits could mean a reduction but also a prevention of carbon emissions)
<b>Effectiveness</b>	Emissions reduction target is guaranteed by the overall cap	Problems with quality of credits and double counting
<b>Efficiency</b>	Target is met at the lowest costs (with the cheapest technologies within your company).	Emission reduction and/or avoidance happens in regions with the lowest costs (cheapest projects outside your company)
<b>Moral hazard</b>	No: it pays off to lower emissions if you are subject to a mandatory scheme	Yes: will companies reduce their own emissions forcefully if they can 'simply' offset their emissions?
<b>Current market size</b>	~10 gigaton CO2 globally	~0.2 gigaton CO2 globally

Source: ING Research

Carbon credits can be grouped into two categories dependent on the type of offsetting project that generates the credits:

Avoidance projects avoid emitting greenhouse gases. Projects to prevent deforestation are a case in point; they don't reduce emission levels but they prevent net emissions from rising as felled trees can no longer capture carbon.

Removal projects aim to actually reduce current emission levels.

So the quality of carbon credits differs in VCM. Removal projects tend to trade at a [premium to avoidance credits](#). Corporate decision-makers need to take this into account as not all carbon credits are considered effective and credible emission reduction strategies by shareholders, like NGOs, or employees.

One possible drawback from VCMs is that companies may behave less responsibly towards climate



change if they can simply offset their emissions instead of having to reduce emissions themselves the hard way ([moral hazard](#)). Mandatory carbon markets simply force companies to lower their emissions or to pay a fine for it in terms of the carbon price.

## Will companies voluntarily reduce emissions if they have the option to offset elsewhere?

Moral hazard dilemma in voluntary carbon markets



Source: ING Research

## ...now that COP26 reconnects mandatory and voluntary carbon markets

In the past, under the Kyoto protocol, there was a link between mandatory and voluntary carbon markets. In Europe for example, owners of power plants and factories in heavy industries could convert offsetting credits (Certified Emission Reductions, CERs) to carbon allowances in the EU Emissions Trading System.

This link was [removed](#) due to long-standing double-counting concerns about the quality of offsetting projects, mismanagement of projects, double-counting of credits and even fraud.

After years of negotiations, in the autumn of 2021, [COP26](#) agreed on a rulebook to eliminate most of these issues, referred to as Article 6 of the treaty. This is a little known, and technically complex, set of rules to strengthen VCMs. [Hence we dedicate a separate article to it.](#)

If implemented well, Article 6 could re-establish the conversion of offsetting credits to carbon allowances, putting both on the agenda of corporate decision-makers.

### Author

#### Gerben Hieminga

Senior Sector Economist, Energy

[gerben.hieminga@ing.com](mailto:gerben.hieminga@ing.com)

#### Samuel Abettan

Junior Economist

[samuel.abettan@ing.com](mailto:samuel.abettan@ing.com)

## Disclaimer

This publication has been prepared by the Economic and Financial Analysis Division of ING Bank N.V. ("ING") solely for information purposes without regard to any particular user's investment objectives, financial situation, or means. *ING forms part of ING Group (being for this purpose ING Group N.V. and its subsidiary and affiliated companies)*. The information in the publication is not an investment recommendation and it is not investment, legal or tax advice or an offer or solicitation to purchase or sell any financial instrument. Reasonable care has been taken to ensure that this publication is not untrue or misleading when published, but ING does not represent that it is accurate or complete. ING does not accept any liability for any direct, indirect or consequential loss arising from any use of this publication. Unless otherwise stated, any views, forecasts, or estimates are solely those of the author(s), as of the date of the publication and are subject to change without notice.

The distribution of this publication may be restricted by law or regulation in different jurisdictions and persons into whose possession this publication comes should inform themselves about, and observe, such restrictions.

Copyright and database rights protection exists in this report and it may not be reproduced, distributed or published by any person for any purpose without the prior express consent of ING. All rights are reserved. ING Bank N.V. is authorised by the Dutch Central Bank and supervised by the European Central Bank (ECB), the Dutch Central Bank (DNB) and the Dutch Authority for the Financial Markets (AFM). ING Bank N.V. is incorporated in the Netherlands (Trade Register no. 33031431 Amsterdam). In the United Kingdom this information is approved and/or communicated by ING Bank N.V., London Branch. ING Bank N.V., London Branch is authorised by the Prudential Regulation Authority and is subject to regulation by the Financial Conduct Authority and limited regulation by the Prudential Regulation Authority. ING Bank N.V., London branch is registered in England (Registration number BR000341) at 8-10 Moorgate, London EC2 6DA. For US Investors: Any person wishing to discuss this report or effect transactions in any security discussed herein should contact ING Financial Markets LLC, which is a member of the NYSE, FINRA and SIPC and part of ING, and which has accepted responsibility for the distribution of this report in the United States under applicable requirements.

Additional information is available on request. For more information about ING Group, please visit [www.ing.com](http://www.ing.com).